What is claimed is:

Claims

1. A method of reducing adverse effects of endotoxin in a warm-blooded animal, which method comprises administering to the warm-blooded animal an effective amount of a composition comprising rough, complete-core lipopolysaccharide (LPS) antigen of *E. coli* K12.

2. The method of claim 1 in which the composition further comprises rough, complete-core lipopolysaccharide (LPS) antigen of a second bacteria other than *E. coli* K12.

3. The method of claim 1 in which the animal is a mammal.

4. The method of claim 2 in which the mammal is a human patient.

5. The method of claim 1 in which the composition comprises LPS of an R_a rough *E. coli* K12.

6. The method of claim 2 in which the second bacterium is an *E. coli* or a *Salmonella* bacterium.

7. The method of claim 2 in which the second bacteria is a Bacteroides.

8. The method of claim 2 in which the composition comprises complete-core, rough, LPS antigen from a third Gram-negative bacterium different from the first and from the second Gram-negative bacterium.

9. The method of claim 8 in which the composition comprises complete-core, rough, LPS antigen from a fourth Gram-negative bacterium different from each of the first, the second, and the third Gram-negative bacteria.

10. The method of claim 2 in which the second Gram-negative bacterium is *E. coli* R1.

11. The method of claim 2 in which the second Gram-negative bacterium is a *Salmonella* bacterium.

12. The method of claim 8 in which the second bacterium is a Klebsiella and third bacterium is a Pseudomonad.

13. The method of claim 9 in which the second bacterium is a Klebsiella, the third bacterium is a Pseudomonad, and the fourth bacterium is a Bacteroides.

14. The method of claim 6 or claim 11 in which the *Salmonella* bacterium is *Salmonella minnesota* R60.

15. The method of claim 9 in which core antigen from each of the four bacteria is present in generally equal amounts by weight.

16. The method of claim 7 in which the composition comprises LPS antigens from at least two different Gram-negative bacterial strains of the same species.

17. The method of claim 1 in which the antigen causes the patient to produce an antibody that binds to an epitope in the core region of the LPS of at least one Gram-negative bacterial strain whose LPS is not part of the composition.

18. The method of claim 17 in which the patient's antibody binds to the LPS of at least one smooth Gram negative bacterial strain.

19. The method of claim 1 in which the composition comprises the antigen in a liposome.

20. The method of claim 19 in which the ratio (weight:weight) of lipid in the liposome to the LPS antigen is between 1:1 and 5000:1.

21. The method of claim 20 in which the ratio (weight:weight) is between 10:1 and 1000:1.

22. The method of claim 19 in which the liposome comprises a component selected from the group consisting of: phospholipid, cholesterol, positively charged compounds, negatively charged compounds, amphipathic compounds.

23. The method of claim 19 in which the liposome is a multilamellar type liposome (MLV).

24. The method of claim 19 in which LPS in the acid salt form is incorporated into the liposome.

25. The method of claim 19 in which the liposome is a small or large unilamellar liposome (SUVs and LUVs).

26. The method of claim 1 in which the composition is administered intramuscularly, intravenously, subcutaneously, intraperitonealy, via the respiratory tract, or via gastrointestinal tract.

27. The method of claim 1 in which the dose of antigen is over 0.01 ng per kilogram of patient body weight.

28. The method of claim 27 in which the dose is less than 1000ng per kilogram of patient body weight.

29. The method of claim 27 in which the dose is less than 100 micrograms per kilogram of patient body weight.

30. The method of claim 1 in which the composition is administered in multiple doses, the first of which is administered at least 2 days prior to potential endotoxin exposure.

31. The method of claim 1 in which the antigen is present in a killed bacterium.

32. The method of claim 1 in which the antigen is separated from the bacterium.

33. The method of claim 1 in which the antigen is chemically detoxified.

34. The method of claim 1 or claim 31 in which the bacterium is genetically engineered.

35. The method of claim 1 in which the composition further comprises an adjuvant.

36. The method of claim 33 in which the adjuvant is alum.

37. A vaccine composition for reducing the adverse effects of endotoxemia in a human patient which comprises an effective amount of a composition comprising purified complete core rough lipopolysaccharide antigen of *E. coli* K12, said composition further comprising liposomes which contain the antigen.

38. A method of reducing adverse effects of endotoxin in a warm-blooded animal, which method comprises administering to the warm-blooded animal an effective amount of a composition comprising rough lipopolysaccharide (LPS) antigen of a Gram-negative bacterium, said LPS antigen comprising the component of an E. coli Rb LPS, or the equivalent thereof in another species.

39. A method of quantitating lipopolysaccharide incorporated into liposomes by performing periodic acid/Schiff base staining.

40. The method of claim 39 in which the test is performed on a vaccine lot intended for clinical use.

41. A method of reducing adverse effects of endotoxin in a warm-blooded animal, which method comprises administering to the warm-blooded animal an effective amount of antibody produce by immunization with a composition accoring to claim 1.

42. The method of claim 41 in which the antibody comprises a substantial percentage of IgM antibody.

43. A method of reducing adverse effects of endotoxin in a warm-blooded animal, which method comprises administering to the warm-blooded animal an effective amount of a composition comprising rough, complete-core lipopolysaccharide (LPS) antigen of a gram negative bacterium.

add A2

add B13